USDA FOREST SERVICE, DFTM R&D PROGRAM

ENVIRONMENTAL ANALYSIS REPORT

FIELD EXPERIMENTS TO EVALUATE ACEPHATE, CARBARYL, DIFLUBENZURON, PYRETHRINS, AND *BACILLUS THURINGIENSIS* FOR CONTROLLING THE DOUGLAS-FIR TUSSOCK MOTH

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Prepared by*:

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Recommended by:

5/18/77

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I. SUMMARY

The USDA Forest Service proposes a field experiment on about 50 acres on the Santa Fe National Forest in June 1977 to determine the effectiveness of the following pesticides against the Douglas-fir tussock moth:

Orthene® (acephate)
Sevin® 50 WP (carbaryl)
Dimilin® (diflubenzuron)
Pyrocide Growers Spray® (pyrethrins)
Biotrol® WP (Bacillus thuringiensis)
Dipel® WP (Bacillus thuringiensis)
Thuricide® 16B (Bacillus thuringiensis)

All the chemical pesticides to be used will cause mortality to some beneficial insects. Orthene® and Sevin® are highly toxic to honeybees. No long-term biological impacts from the project are expected in either the Water Influence or Intermediate Zones.

This field experiment is part of an accelerated research and development effort to develop environmentally acceptable pesticides for control of the Douglas-fir tussock moth. A field experiment is required by the Forest Service and considered desirable by the Environmental Protection Agency before any pesticide can be registered for insect control.

II. DESCRIPTION

There is a need to determine effectiveness of ground applications of both chemical and biological insecticides to protect individual high-value trees from defoliation by the Douglas-fir tussock moth (Orgyia pseudotsugata McDunnough). Biology of the insects and its impacts on trees are well documented in the literature (Anon. 1969; Wert and Wickman 1970; Wickman 1958; Wickman 1963; Wickman and Scharpf 1972; Wickman et al. 1971) and will not be covered in this appraisal.

The development and recommendations for use of any pesticide by the Forest Service follow an established program. The materials are first tested in the laboratory under a variety of bioassay procedures. Materials found to be promising in the laboratory are then evaluated in small-scale field experiments which usually test several formulations, application rates, and application methods. This is part of a nationwide effort to meet the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act of 1972, as amended, for registration of pesticides for specific pests applied by specific methods. In developing this environmental analysis, an

interdisciplinary team consisting of these specialists was consulted: entomologist, pesticide specialist, plant pathologist, forester, and information specialist. The Regional Pesticide-Use Coordinating Committee is aware of this program; however, their review is not required for programs of this type.

A. Proposed Action

1. Chemical Insecticides

Pesticides to be used and their formulations are:

Orthene® - ½ lb. active ingredient (a.i.) per 100 gallons of water
Sevin® - ½ lb. a.i. per 100 gallons of water
Dimilin® - 1/8 lb. a.i. per 100 gallons of water
Pyrethrins - 1/10 lb. a.i. per 100 gallons of water

The four insecticide treatments, plus a check (no treatment), will be randomly assigned to 50 trees (10 replicates for each treatment). The formulated insecticides will be applied to the point of runoff with a truck-mounted hydraulic sprayer. Every effort will be made to avoid getting any of the chemical pesticides in the riparian and aquatic ecosystem.

Background data on these four insecticides are on file with the Douglas-fir Tussock Moth Program, P. O. Box 3141, Portland, Oregon 97208.

2. Bacillus thuringieneis Berliner

Each of three materials, Biotrol®, Dipel®, and Thuricide®, will be tested in a tank mix of 2 to 5 percent Cargill Insecticide Base® (molasses). The materials will be tested at 2 dosages, 14.5×10^7 and 28×10^7 international units of potency per gallon of spray. These dosages are equivalent to 0.2 and 0.4 pounds of Biotrol® and Dipel®, and to 343 and 686 ml of Thuricide® per 10 gallons of formulation. Applications will be made both in the morning (6 to 8 a.m.) and evening (6 to 8 p.m.).

The three materials, plus a check (no treatment), will be randomly assigned to 160 trees in a 4 x 2 x 2 design (3 products plus a check, 2 dosage levels, 2 timings; with 10 replicates). Materials will be applied to the point of runoff with a truck-mounted hydraulic sprayer. There is no need to have treatment controls for the biological insecticides because they generally affect only lepidopterous insects and will not affect aquatic insects or degrade water quality.

Background data on Bacillus thuringiensis is on file with the Douglas-fir Tussock Moth Program, P. O. Box 3141, Portland, Oregon 97208.

B. Objectives

The objectives of the field experiment are:

1. To evaluate and compare effectiveness of ground application of the 4 chemical insecticides to protect individual trees from Douglas-fir tussock moth defoliation.

2. To evaluate and compare effectiveness of ground application of the 3 Bacillus thuringiensis products to protect individual trees from Douglas-fir tussock moth defoliation.

3. To evaluate and compare 2 dosage levels of the 3 B. thuringiensis products.

4. To evaluate and compare morning and evening applications of the 3 B. thuringiensis products.

C. Location

The proposed site for the field experiment is on the Tesuque Ranger District, Santa Fe National Forest, New Mexico (see Figures 1 and 2). The primary concerns in the project area, where trees will be treated, are the effects on the riparian and aquatic ecosystems in the Water Influence and Intermediate Zones. This site was selected because there are no other infestations in the West with sufficiently high populations.

1. Water Influence Zone

a. Description

This zone is within Medio Dia Canyon where a small stream flows yearlong. The zone is characterized with mixed conifer and associated vegetation along side the stream. The canyon is narrow, from 100 feet to 400 feet wide in the widest location, with the canyon walls rising abruptly on either sides. The area receives use from recreationists visiting the Cochiti Canyon area, mostly for hiking and occasionally for tent camping. Streamflow is below minimums to support fisheries; however, trout are found in the stream.

b. Water Influence Zone Management Emphases

Management emphases will be directed towards maintaining or improving water quality and the production of amenity values such as

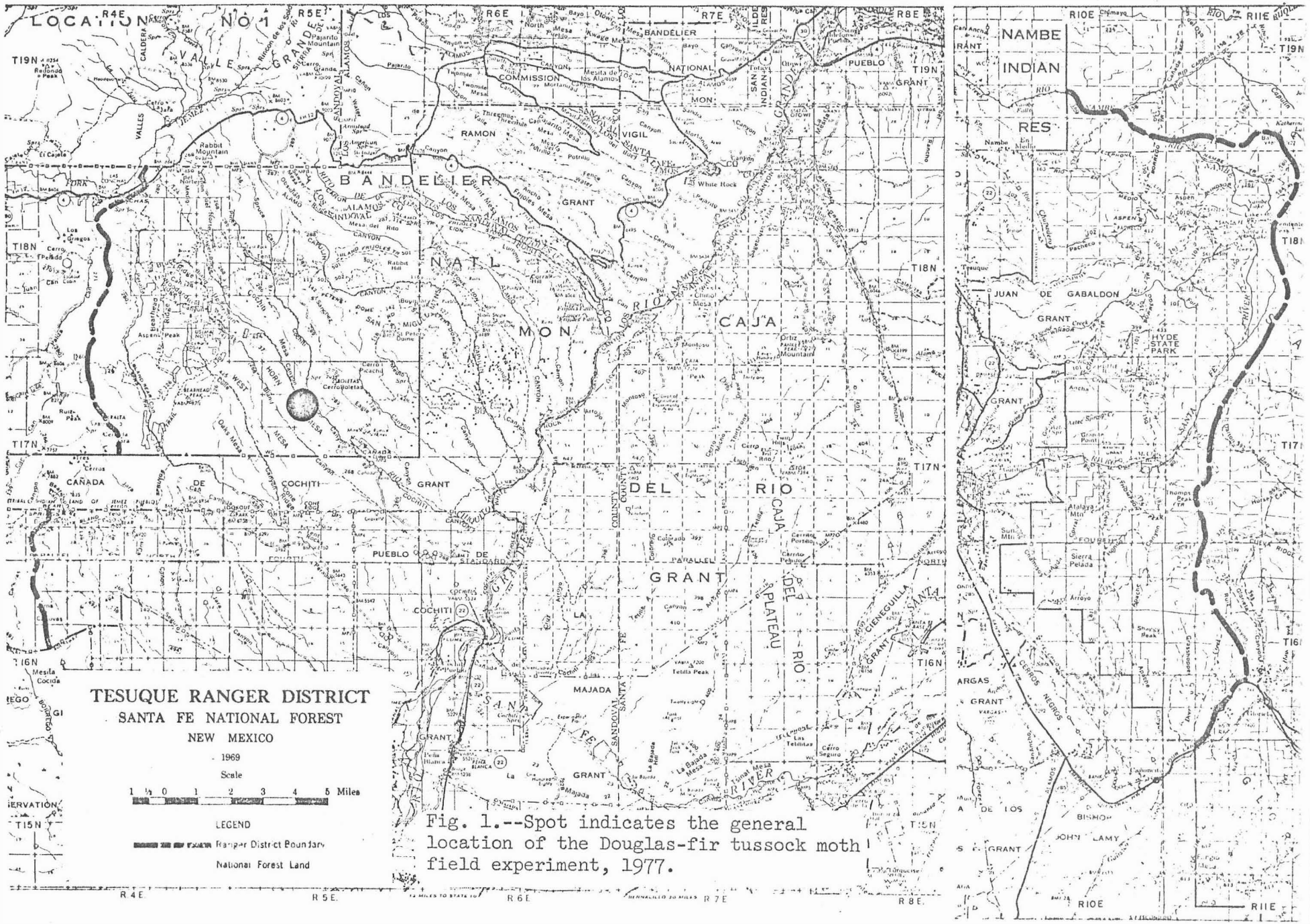

Fig. 1.--Spot indicates the general location of the Douglas-fir tussock moth field experiment, 1977.

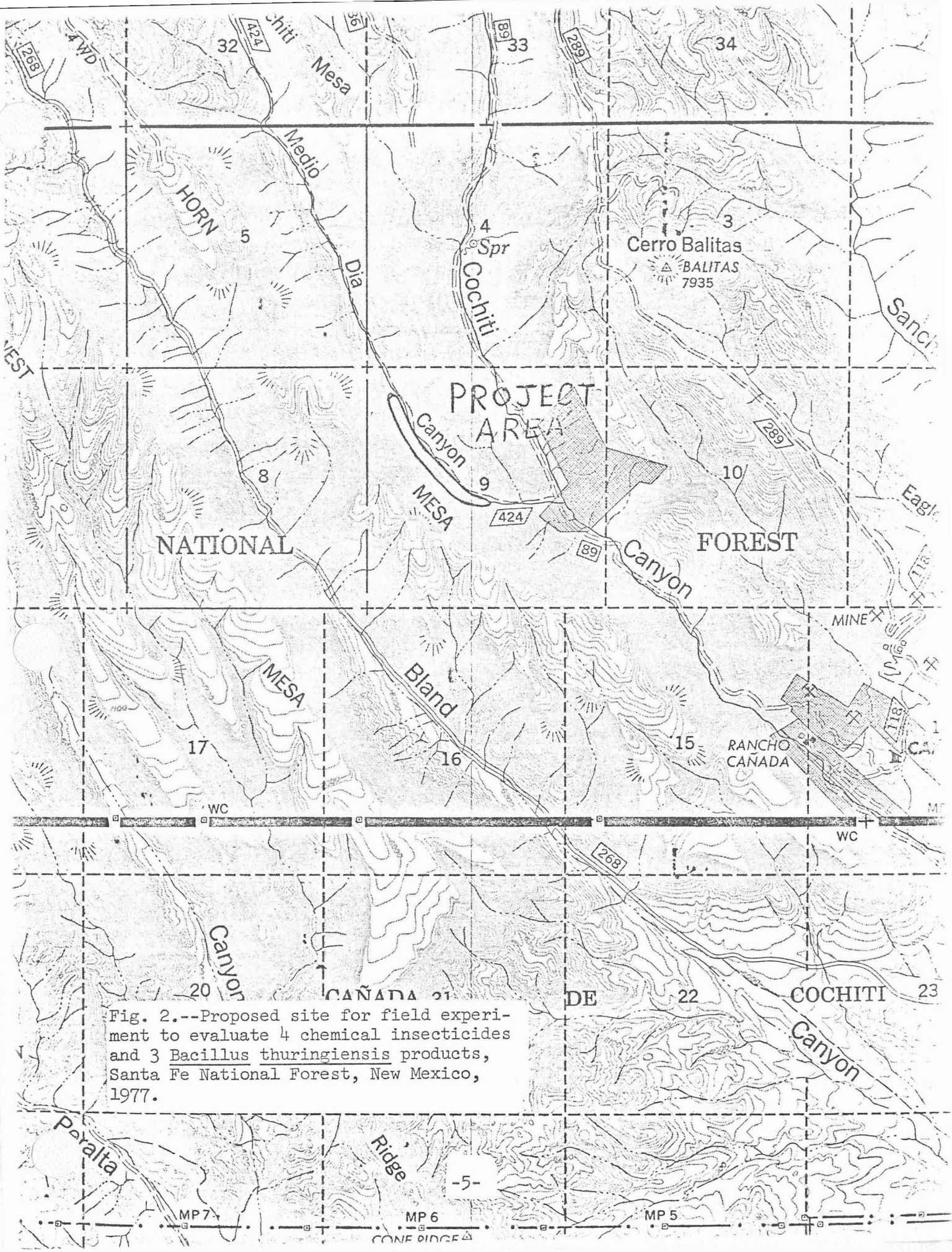

Fig. 2.--Proposed site for field experiment to evaluate 4 chemical insecticides and 3 Bacillus thuringiensis products, Santa Fe National Forest, New Mexico, 1977.

improved aquatic environment, beauty of the landscape, outdoor recreational qualities, and wildlife and fisheries for public enjoyment.

2. Intermediate Zone

a. Description

This zone is adjacent to the Water Influence Zone on both sides of the canyon and is characterized by steep, 40 percent to near vertical bluffs, with scattered mixed conifer and associated vegetation on the north- and east-facing slopes, and spruce, ponderosa pine, and associated vegetation on the south- and west-facing slopes.

b. Emphases

Management emphases will be directed toward managing the land to maintain soil stability and water quality.

III. ENVIRONMENTAL IMPACTS

A. Physical and Biological

1. Orthene® (acephate)

Direct contact with Orthene® irritates the eyes and causes moderate skin irritation on abraded skin. No irritation occurs on intact skin.

Fish continually exposed to Orthene® accumulate small quantities of the chemical in body tissue. Orthene's toxicity to fish is extremely low and it poses little hazard to fish populations.

Orthene® is highly toxic to honeybees directly exposed to it, and application when honeybees are active should be avoided.

Orthene® will reduce populations of some beneficial insects present at the time of application.

Orthene® penetrates plant tissues quickly and is rapidly degraded.

Soil microorganisms rapidly degrade Orthene® so that it is unavailable to succeeding crops.

2. Sevin® (carbaryl)

Populations of some soil-inhabiting invertebrates will decline initially, but will recover within a year of application.

Sevin® is highly toxic to many species of insects inhabiting the forest. Application will adversely affect some beneficial insects, but its effect should be transitory.

Sevin® is highly toxic to honeybees, but hives that are removed from treated areas during application and returned 1 week later do not suffer economic loss.

Sevin® causes foliar injury to apples, especially McIntosh and York varieties. Boston ivy is also injured.

Direct application of Sevin® over open water could cause some fish mortality, but steps will be taken to prevent direct application.

A temporary decline in numbers of aquatic insects (stoneflies, mayflies, dragonflies) will occur following Sevin® application.

Phytoplankton may be affected by Sevin® if concentrations in water reach or exceed 0.1 ppm.

Sevin® may stimulate the growth of fresh water algae, causing a "bloom."

Sevin® will concentrate in and on the upper soil surface; effect of this concentration is unknown.

3. Dimilin® (diflubenzuron)

Some beneficial insects will be killed by application of Dimilin®.

Immature aquatic insects and amphipods suffer mortality when Dimilin® is applied in normal amounts, but populations soon recover since Dimilin® has very little effect on adults.

Dimilin® has no impact on adult honeybees and will not interfere with brood development of hives placed within a treated area.

Birds and fish are not affected by normal application rates of Dimilin®.

Zooplankton may be adversely affected by Dimilin® in slow-moving streams.

4. Pyrethrins

Pyrethrins are extremely toxic to aquatic insects.

Some other beneficial insects will be killed because of pyrethrins' broad spectrum of activity.

Pyrethrins' toxicity to mammals is extremely low; it is presently the only insecticide which may be labeled "non-toxic to humans and pets."

5. Bacillus thuringiensis (B.t.)

Direct contact with B.t. irritates the eyes and causes moderate skin irritation on abraded skin. No irritation occurs on intact skin.

Inhalation of B.t. powder may cause discomfort, but recovery is rapid.

B.t. has no effect on beneficial insects such as honeybees. Birds and fish are not affected by B.t. applications

B. Ecosystem

Without proper precautions, the ecosystem in Media Dia Canyon could be adversely affected as follows:

1. Chemical insecticides could enter the stream and severely reduce aquatic insects and affect water quality.

2. Travel over the access route up the canyon would increase due to removal of trees blocking the temporary road.

3. Excess soil disturbances will result if vehicles are driven on slopes over 20 percent.

4. Aesthetic values would be reduced if selected trees are conspicuously marked with permanent markers.

5. Private landowners will be suspicious of the project if they are not well informed.

C. Economic

A benefit-cost analysis is not being made because:

1. The objective of the project is to determine the effectiveness of the insecticides against the Douglas-fir tussock moth and not to suppress an outbreak.

2. The information on costs from these tests will be used to develop cost-benefit analyses for future projects.

IV. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

A. Orthene®

Orthene® will reduce populations of some beneficial insects. Any honeybees present at the time of treatment will be killed.

B. Sevin®

Populations of some soil-inhabiting invertebrates under treatment trees will decline. Sevin® will reduce populations of some beneficial insects. Any honeybees present at the time of treatment will be killed.

C. Dimilin®

Dimilin® will reduce populations of some beneficial insects. Immature aquatic insects, amphipods, and zooplankton will be adversely affected if Dimilin® is introduced into stream, but steps will be taken to prevent drift into the riparian and aquatic ecosystems.

D. Pyrethrins

Pyrethrins will reduce populations of some beneficial insects. Aquatic insects in particular are highly susceptible to pyrethrins, but there should be no contamination of the stream.

E. Bacillus thuringiensis

No adverse effects have been identified.

V. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

There are no known long-term effects of the field experiment on productivity since this is not an operational Douglas-fir tussock moth control project. If one or more of the chemicals and one or more of the Bacillus thuringiensis products are registered by the Environmental Protection Agency for ground application, their future use could have a long-term effect on protection of individual, high-value trees, and hence on productivity of amenities.

VI. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There will be no known irreversible or irretrievable commitment of threatened or endangered plant or animal species, historical or archeological features, wilderness characteristics, or any other resources as a result of the proposed field experiment.

VII. ALTERNATIVE TO PROPOSED ACTION

No action.--This course of action would leave the Forest Service in the current position of having few alternatives for protection of individual, high-value trees from Douglas-fir tussock moth defoliation.

This field experiment is part of an accelerated research and development effort to develop environmentally acceptable pesticides for control of the Douglas-fir tussock moth. A field experiment is a requirement by the Forest Service and considered desirable by the Environmental Protection Agency before any pesticide can be registered for insect control. Several alternatives are being tested with this program.

VIII. MANAGEMENT CONSTRAINTS

The following constraints will be used to prevent adverse effects on the ecosystem in Medio Dia Canyon:

1. Trees treated with the chemical insecticides will be no closer than 50 feet from the stream to prevent contamination.

2. To prevent drift, treatment with chemical insecticides will not be done if winds exceed an estimated 10 miles per hour or spray is observed moving toward the stream.

3. Mixing of chemicals will be done at least 100 feet back from the stream to prevent problems resulting from a spill.

4. Any excess material will be sprayed on additional infested trees. There will be no dumping of excess material in the project area or elsewhere.

5. The Medio Dia access route will not be widened, and personnel will plan the job to minimize travel on the temporary road. The route will be closed after the project as directed by the Tequeue District Ranger.

6. Vehicles will not leave the road. Spray rigs will have sufficient hose to treat trees. No side routes will be opened to treatment trees.

7. Tree markers and reference points will be temporary and will be removed after the project is completed. Spray paint will not be used.

8. The Tesuque District Ranger and project personnel will inform appropriate private landowners prior to starting tree treatment.

IX. CONSULTATION WITH APPROPRIATE FEDERAL AGENCIES AND REVIEW BY STATE AND LOCAL AGENCIES DEVELOPING AND ENFORCING ENVIRONMENTAL STANDARDS

This analysis was prepared and reviewed by an interdisciplinary Forest Service team. In addition, the list of References Cited and the background documents on file with the Douglas-fir Tussock Moth Program, P. O. Box 3141, Portland, Oregon 97208, were consulted in writing this analysis.

X. ENVIRONMENTAL STATEMENT RECOMMENDATION

This is not a major Federal action and will result in no major environmental effects; therefore, an environmental impact statement will not be written.

XI. REFERENCES CITED

The following list of published material is on file with the Douglas-fir Tussock Moth Program, P. O. Box 3141, Portland, Oregon 97208:

Anonymous. 1969. Douglas-fir tussock moth damage in the Northern Region. USDA Forest Serv. Northern Reg. Leaflet.

Wert, S. L., and B. E. Wickman. 1970. Impact of Douglas-fir tussock moth...color aerial photography evaluates mortality. USDA Forest Serv. Res. Pap. PSW-60.

Wickman, B. E. 1958. Mortality of white fir following defoliation by the Douglas-fir tussock moth in California, 1957. USDA Forest Serv. PSW Res. Note No. 137.

Wickman, B. E. 1963. Mortality and growth reduction of white fir following defoliation by the Douglas-fir tussock moth. USDA Forest Serv. Res. Pap. PSW-7.

Wickman, B. E., and R. F. Scharpf. 1972. Decay in white fir top-killed by Douglas-fir tussock moth. USDA Forest Serv. Res. Pap. PNW-133.

Wickman, B. E., G. C. Trostle, and P. E. Buffam. 1971. Douglas-fir tussock moth. USDA Forest Serv. Forest Pest Leafl. 86.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Santa Fe NF

Files 4650
DFTM Files

REPLY TO: 5200 Forest Insect & Disease Control

May 19, 1977

SUBJECT: Douglas Fir Tip Moth EAR ?

TO: District Ranger, Tesuque RD

Enclosed is the approved EAR for this project.

CHRISTOBAL B. ZAMORA
Forest Supervisor

cc: Regional Forester

Copy of approved EAR sent to Jack Dewey, DFTM, Portland, & Owen Dooling, R-1.
JMP
5/25/77